

Lecture notes

Proximal histidine binds with fifth Co-ordination site of heme unit through histidine moiety. Distal histidine does not attach with Fe in oxy and deoxy form.

- i) Imidazole group in proximal histidine (F8) acts as a good ~~o-donor~~ σ -donor to facilitate the central metal to act as a π -donor.
- ii) π -donor central metal can donate electron density towards π -acid ligand O_2 . O_2 acts as relatively strong field ligand.

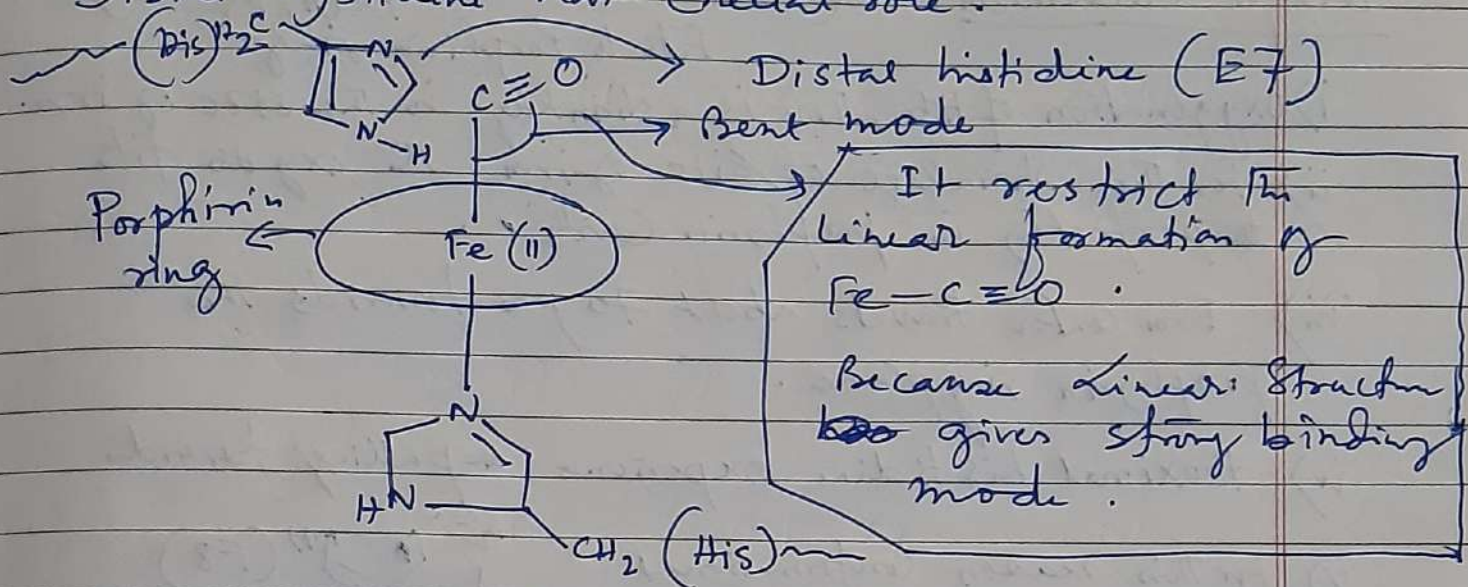
CO is a powerful poison to Hb and Mb.
~~oxygen high aff~~ Heme group has high affinity towards CO.

Experimental Observation

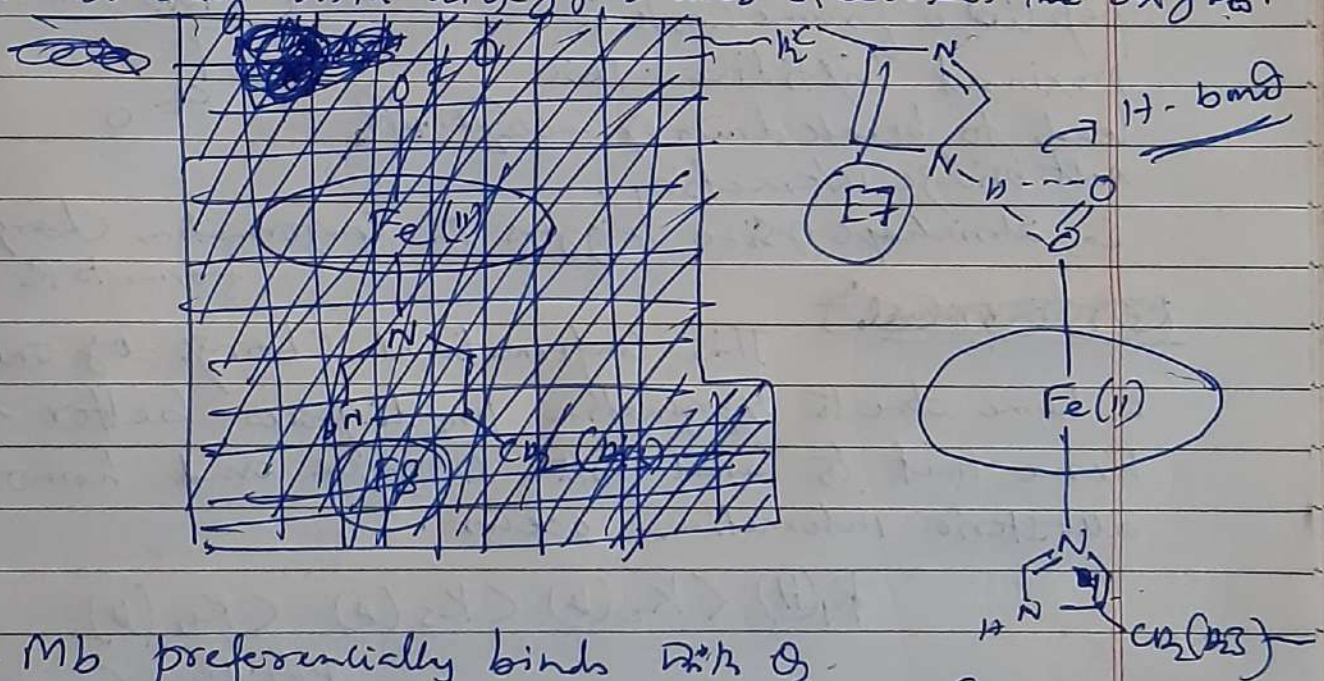
Isolated Heme unit \longrightarrow CO binding affinity
 2.5×10^4 times as O_2 binding
In Hb or Mb \longrightarrow 2×10^2 times only.

From that observation ~~at to~~ we assume that globin protein has some role to diminish CO affinity.

Distal histidine has crucial role.



But in oxygen binding case, the distal histidine makes H-bonding with dioxygen and stabilizes the $OxHb$.



Hb & Mb preferentially binds with O_2 by H bonding. Steric factors also contribute (15%) for this preference.

<u>Note</u>	<u>DeoxyHb</u>
<u>R-State</u>	<u>T-State</u>
These interactions are destroyed	<ol style="list-style-type: none"> ① H-bonding ② Hydrophobic interaction (non polar part) ③ Salt bridge interaction

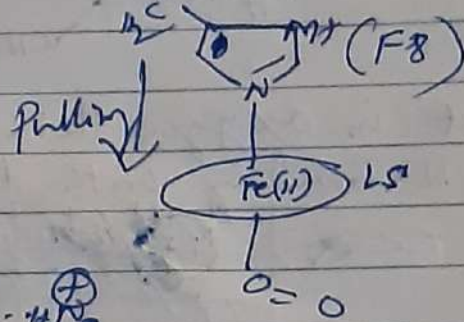
Trigger Mechanism :- (Size of Fe(II)LS is smaller than Fe(II)HS)
Fits to Porphyrin ring

- i) Oxygenation of Hb, There is a shrinkage in the size of iron.
- ii) For this shrinkage of size of iron the oxy Hb fits perfectly in porphyrin cavity.
- iii) Iron center travels about 70 pm towards the porphyrin ring plane.

iv) Proximal histidine experience a pulling towards

v) For this reason Conformational

change occurs through out peptide frame work in proximal histidine. This leads to break down of $-\text{CO}_2^- \cdots \text{NH}_3^+$ salt bridge interaction.



So, shrinkage of size triggers the conformational change, T form to R form.



This conformational change of one unit in heme due to oxygenation predisposes better another heme unit to bind with oxygen and homotropic allosteric interaction occurs.

$$K_1(\text{H}) < K_2(\text{H}) < K_3(\text{H}) < K_4(\text{H})$$

Positive Co-operative effect.

MO diagram:-

